Evaluation of Market Advisory Service Performance in Hogs

by

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Abstract

The purpose of this paper is to investigate the pricing performance of agricultural market advisory services in hogs. Pricing recommendations are available for all quarters from the beginning of 1995 through the end of 2001. The results show that average differences between advisory programs and market benchmarks are small in nominal terms for all three benchmarks, -$0.41/cwt., $0.00/cwt. and -$0.27/cwt. versus the cash, index and empirical benchmarks, respectively, and none of the average differences are significantly different from zero. Hence, advisory programs as a group do not outperform the market benchmarks in terms of average price. Advisory programs also do not outperform the market benchmarks in terms of average price and risk. Finally, there is little evidence that advisory programs with superior performance can be usefully selected based on past performance in the hog market.

The Performance of Agricultural Market Advisory Services in Hogs

Management of price volatility is an important aspect of business for hog producers. Hog price variability is often the highest rated source of income variability identified by producers (e.g., Patrick, et al.). While vertical integration and contracting have increased rapidly in recent years, at least partially in response to price risk, over 70% of producers still use cash market sales to some extent (Patrick, et al.). Consequently, price risk management is still a major concern for producers. One approach to managing this risk is the use of market advisory services. For a subscription fee, these services give specific recommendations to producers on how and when to price their production.

Despite the popularity of market advisory services among livestock producers (e.g., Schroeder, et al.), there is no evidence regarding the performance of these services in livestock markets. Previous studies of market advisory service performance have been limited to grain markets (Gehrt and Good; Martines-Filho; Jirik et al.; Irwin, Martines-Filho and Good). The evidence in these studies suggests a limited ability to outperform the market in corn and soybeans and no ability in wheat. It is not known whether the results generalize to livestock commodities. Livestock marketing is quite different from grain marketing, due to the non-storable nature of livestock and relatively constant production through time. It is therefore reasonable to argue that different marketing strategies may be optimal in livestock markets, as compared to grains. Hence, market advisory service performance may be different in livestock markets.

The purpose of this paper is to investigate the pricing performance of agricultural market advisory services for hogs. Following Irwin, Martines-Filho and Good two key performance questions will be addressed: 1) Do market advisory services, on average, outperform an appropriate hog market benchmark? and 2) Do market advisory services exhibit persistence in their performance in the hog market over time? The data for the study is provided by the Agricultural Market Advisory Service (AgMAS) Project. Pricing recommendations are available for all quarters from the beginning of 1995 through the end of 2001. This 28 quarter sample should be large enough to provide a reasonably reliable estimate of true market advisory service performance in the hog market. Also, the sample period is characterized by large variation in hog prices, ranging from the relatively high prices of 1996 to the drastic price drop of late 1998. Since the AgMAS Project subscribes to all of the services and collects "real-time" recommendations, the data is not subject to survivorship bias. Finally, while the sample of advisory services is non-random, it is constructed to be generally representative of the majority of advisory services offered to hog producers.

The procedure used to compute net hog prices for each advisory program is similar to the procedure used in earlier AgMAS Reports (e.g., Irwin, Martines-Filho and Good). In particular, after the stream of recommendations is collected for hogs in a particular quarter, the net price that would have been received by a hog producer who precisely follows the set of pricing recommendations is computed. Since cash hog pricing recommendations are often limited and quite short-run in nature, the same cash

marketing strategy will be assumed for all services. Therefore, the net advisory price will be computed as the quarterly average cash sale price plus or minus gains/losses and brokerage costs associated with futures and options transactions. The first performance test compares the average price of advisory programs and benchmarks. The second compares both the average price and risk of advisory programs and benchmarks. The third evaluates the predictability of advisory program performance from period-to-period. Three market benchmarks are developed for the evaluations.

Market Advisory Service Recommendations

The AgMAS Project was initiated in 1994 with the goal of providing unbiased and rigorous evaluation of market advisory services. Five criteria have been used to determine which advisory services are included in the AgMAS study. First, marketing recommendations from an advisory service must be received electronically in real time. Second, a service has to provide marketing recommendations to hog producers rather than (or in addition to) speculators or "traders." Third, marketing recommendations from an advisory service must be in a form suitable for application to a representative hog producer. That is, the recommendations have to specify the percentage of hog production involved in each transaction ---futures or options--- and the price or date at which each transaction is to be implemented. Fourth, advisory services must provide "blanket" or "one-size fits all" marketing recommendations so there is no uncertainty about implementation. Fifth, a candidate service must be a viable, commercial business.

The original sample of market advisory services was drawn from the list of Premium Services available from the two major agricultural satellite networks, Data Transmission Network (DTN) and FarmDayta, in the summer of 1994.[1] While the list of advisory services available from these networks was by no means exhaustive, it did have the considerable merit of meeting a market test. Presumably, the services offered by the networks were those most in demand by farm subscribers to the networks. In addition, the list of available services was cross-checked with other farm publications to confirm that widely followed advisory firms were included in the sample. It seems reasonable to argue that the resulting sample of services was generally representative of the majority of advisory services available to farmers.

Additions and deletions to the sample of advisory services have occurred over time. Additions largely have been due to the increasing availability of market advisory services via alternative means of electronic delivery, in particular, websites and e-mail. Deletions have occurred for a variety of reasons. A total of 15 advisory service programs for hogs have been included in the sample at some point in time.[2] Table 1 contains the complete list of advisory programs and includes a brief explanation why each program not included for all marketing quarters is added or deleted from the sample. The term "advisory program" is used because one advisory service has more than one distinct marketing program for hogs (AgriVisor).

Three forms of survivorship bias may be potential problems when assembling an advisory program database. Survival bias significantly biases measures of performance

upwards since "survivors" typically have higher performance than "non-survivors" (e.g., Brown et al.; Schneeweis, McCarthy and Spurgin; Brown, Goetzmann and Ibbotson). The first and most direct form of survivorship bias occurs if only advisory programs that remain in business at the end of a given sample period are included in the sample. This form of bias should not be present in the AgMAS database of advisory programs because all programs that have been tracked over the entire time period of the study are included in the sample. The second form of survivorship bias occurs if discontinued advisory programs are deleted from the sample for the quarter when they are discontinued. This is a form of survivorship bias because only survivors for the full marketing quarter are tracked. The AgMAS database of advisory programs should not be subject to this form of bias because programs discontinued during a marketing quarter remain in the sample for that marketing quarter. The third and most subtle form of survivorship bias occurs if data from prior periods are "back-filled" at the point in time when an advisory program is added to the database. This is a form of survivorship bias because data from surviving advisory programs are back-filled. The AgMAS database should not be subject to this form of bias because recommendations are not back-filled when an advisory program is added. Instead, recommendations are collected only for the marketing quarter a decision has been made to add an advisory program to the database.

The AgMAS Project subscribes to all of the services that are followed and records recommendations on a real-time basis, and therefore, the database of recommendations should not be subject to hindsight bias. The information is received electronically, via satellite, website or e-mail. For the programs that provide multiple daily updates, information is recorded for all updates. In this way, the actions of a producer-subscriber are simulated in real-time. The final set of recommendations attributed to each advisory program represents the best efforts of the AgMAS Project staff to accurately and fairly interpret the information made available by each advisory program. In cases where a recommendation is considered vague or unclear, some judgment is exercised as to whether or not to include that particular recommendation. Given that some recommendations are subject to interpretation, the possibility is acknowledged that the AgMAS track record of recommendations for a given program may differ from that stated by the advisory program, or from that recorded by another subscriber.

Marketing Behavior of Advisory Services

Before examining pricing performance, it is useful to understand the marketing behavior of advisory services. Previous research has shown that advisory programs employ a diverse set of futures, options and cash positions in the corn and soybean markets (Bertoli et al.). The marketing behavior of advisory programs in hogs is described in two steps. First, the frequency that advisory programs use various marketing tools is described. Second, the magnitude of marketing tool usage is presented.

Table 2 shows frequency counts of marketing tool use for individual programs across quarters. Note that advisory programs with one year or less of data are excluded to minimize the impact of programs that have only a few positions. The results show that the most frequently used marketing tool is a futures only position, with every program

employing futures in at least one quarter. On average, futures only positions are used in 55.9% of the marketing quarters. The most frequent use of futures only positions is 87.5% of marketing quarters and the least frequent is 7.1%. The vast majority of futures positions are short hedges, as long futures positions are only taken five times throughout the entire study period. Options only positions are used much less frequently than futures only positions. Five programs never use options only positions and the average use of options only positions is 6.9% of the marketing quarters. The most frequent use of options only positions is 35.7%. A combination of futures and options is more popular then options only positions, averaging 23.8% of marketing quarters.[3] Only two programs never used a combination of futures and options positions. Several programs frequently used both futures and options during a marketing window. For example, one program used this marketing tool 70% of the time. The most common type of combination strategy consists of long puts and short calls placed at the same to create a fence strategy. No futures or options positions are observed relatively infrequently.

The various positions that an advisory program can take at a point in time must be weighted in some manner before valid comparisons of the magnitude of marketing tool usage can be made. Since the price exposure of a portfolio of positions is a weighted-average of the price exposures of the individual positions, where the weights are the deltas of the individual positions (Hull), "marketing profiles" can be constructed that are comparable across time and programs.[4] More specifically, a marketing profile shows the net amount priced (sold) by an advisory program, on a cumulative basis, each day over the marketing window. Two marketing profile examples are presented in Figure 1.[5] These profiles nicely illustrate the range in marketing behavior found in the data. The top panel shows a "conservative" approach, where a program engages in a small number of incremental pricing transactions before the marketing quarter (1999:III). The bottom panel shows an "aggressive" approach, which includes a long period of no pricing, two periods where net pricing swings between net short and net long (negative net amount priced) and a relatively large net long position is accumulated going into the marketing quarter (1999:I).

Profiles for each advisory program are combined across all marketing quarters to examine the magnitude of pricing at specific points in time.[6] Table 3 presents the average, minimum and maximum net amount priced for each advisory program 9-months, 6-months, 3-months and the day prior to the beginning of the marketing quarter (0-months). In addition, averages across all programs on these dates are also presented. Results indicate that the amount priced generally is low nine months prior to the marketing quarter, averaging only three percent. The lowest average amount priced is zero percent and the highest is 6.6%. The range for individual programs 9-months prior to the marketing quarter, between zero and 75% priced is nonetheless quite large. The average net amount priced across all programs increases modestly to 7.6% by 6-months prior to the marketing quarter. The range 6-months prior to the marketing quarter is again large, with a minimum net amount priced of zero percent and a maximum of 100%. The average net amount priced more than doubles to 15.0% by 3-months before the marketing quarter. The lowest average amount priced 3-months prior to the marketing quarter is 4.4% and the largest is 27%. A further increase in the average net amount

priced is observed when moving to the day prior to the marketing quarter (0-months), where the average equals 21.7%. Not surprisingly, the range on the day prior to the marketing quarter is the highest, with a minimum net amount priced of -100% and a maximum of 110%. It is interesting to note that the largest average net amount priced at this point in time is a relatively modest 31.6%. Please note that the complete average marketing profile across all programs, broken out by quarter, is presented in Figure 2.

The marketing profile examples suggest several interesting observations. First, the average amount of pricing previous to a marketing quarter is relatively modest. Across all programs, the average cumulative amount priced at the start of a marketing quarter is 21.7%, which can be compared to 39% and 33%, respectively, priced on average by advisory programs at the start of corn and soybean harvest (Irwin, Martines-Filho and Good). Second, even though average pricing is relatively modest, there is large variation in the amount priced within marketing quarters, across marketing quarters and across advisory programs. This suggests advisory programs in hogs frequently engage in what Working termed "selective" hedging strategies.[7] Analogous variation in the net amount priced is found in corn and soybeans within crop years, across crop years and across programs (Irwin, Martines-Filho and Good). Third, the variation in the net amount priced (hedge ratio) is larger than that generated by optimal hedging models in most applications to commodity markets (e.g., Lei, Liu and Hallam; Martines-Filho).[8]

Computing the Returns to Marketing Recommendations

In order to simulate a consistent and comparable set of results across different market advisory programs, certain explicit marketing assumptions are made. These assumptions are intended to accurately depict "real-world" marketing conditions. Several key assumptions are: i) the unit of analysis is a calendar quarter, ii) the representative hog producer uses the Iowa/Minnesota cash hog market, iii) no cash sales advise, if given by a program, is followed due to the limited and short-run nature of cash hog pricing recommendations (typically, a horizon of no more than a few days), iv) hog producers are assumed to be on a constant production schedule, so the net cash sales price equals the average cash market price (Iowa/Minnesota cash price), v) with a few exceptions, the marketing window for a quarter is one year in length and includes the three quarters previous to the marketing quarter and the marketing quarter itself, vi) spot cash prices are converted from carcass prices in order to create a consistent cash price across the entire sample[9] and vii) brokerage costs are charged for all futures and options transactions. Based on these and other assumptions, a weighted-average net price is computed for each advisory program included in a particular marketing quarter.

An example will help illustrate the computation of net advisory prices. For the fourth quarter of 1998, the highest net advisory price is $28.24/cwt., and it is computed as the net cash sales price ($20.34) plus futures and options gain ($8.51) minus brokerage costs ($0.61). Note that under the assumptions outlined above the net cash sales price is the same for all advisory programs. Webber provides complete details on assumptions and computation of net advisory prices.

Three market benchmarks are used to compute the returns to the marketing advice provided by advisory programs. Multiple benchmarks are developed to test the sensitivity of performance results to different benchmark specifications. Market benchmarks are based on the theory of efficient markets.[10] In its strongest form, efficient market theory predicts that market prices always fully reflect available public and private information (Fama). The practical implication is that no trading strategy can consistently beat the return offered by the market. Hence, the return offered by the market becomes the relevant benchmark. In the context of this study, a market benchmark should measure the average price offered by the market over the marketing window of a representative farmer who follows advisory program recommendations. The average price is computed in order to reflect the returns to a naïve, "no-information" strategy of marketing equal amounts each day during the marketing window. The difference between advisory prices and the market benchmark measures the value of advisory service information. The theory of efficient markets predicts this difference, on average, will equal zero.[11]

The first market benchmark assumes the relevant marketing window is the three months of the marketing quarter. The "cash" benchmark is therefore simply the average cash price over the marketing quarter, reflecting the assumption of equal sales each business day of the marketing quarter. Cash benchmark prices turn out to be same as the net cash sales price (Iowa/Minnesota) assumed for the computation of net advisory prices.

The second market benchmark assumes the relevant marketing window is the same as that assumed for advisory programs: the one year period that includes the three quarters previous to the marketing quarter and the marketing quarter itself. In this case, the underlying marketing strategy is to sell an equal amount of hog production each day of the one-year marketing window. Previous to the start of the marketing quarter, this can be accomplished by assuming a producer sells an equal amount of hog production using futures contracts. Since the marketing window begins 9-months prior to the marketing quarter, futures are assumed to be sold daily to build up a 75% hedge position just prior to the start of the marketing quarter. Then, cash sales are made daily during the marketing quarter and hedge positions lifted. It is assumed that the hedged positions are lifted once a month on the Wednesday closest to the 15th of each month of the marketing quarter. This market benchmark is labeled the "index" benchmark, since it reflects an average price offered by the market over the entire one-year marketing window.

The third market benchmark also assumes the relevant marketing window is the one year period that includes the three quarters previous to the marketing quarter and the marketing quarter itself. This benchmark is motivated by the evidence from average marketing profiles (Figure 2) that the average amount hedged by advisory programs tends to be substantially lower than 75% prior to entry into the marketing quarter. An "empirical" market benchmark is specified based on the average marketing profiles. Instead of building up to a 75% hedged position, the average marketing profiles suggest a lower net amount sold prior to the start of the marketing quarter. Pricing percentages used for the first through the fourth quarters are 19.3%, 24.2%, 20.4% and 20.1%,

respectively. Otherwise, the computations follow those discussed above for the index market benchmark.

Net Advisory Prices and Benchmarks

Summary statistics for net advisory prices and corresponding market benchmarks for the first quarter of 1995 through the fourth quarter of 2001 are presented in Tables 4 and 5. Table 4 shows that net advisory prices vary substantially across quarters. The highest average net advisory price, $56.15/cwt., occurred in the second quarter of 1997, while the lowest average net advisory price, $24.13/cwt., occurred in the fourth quarter of 1998. The highest net advisory price for an individual program over the sample period is $59.02/cwt., also obtained in the second quarter of 1997. The lowest net advisory price for an individual program is $19.51/cwt., obtained in the fourth quarter of 1998. It is not surprising that high and low net advisory prices occurred during the same quarters as the high and low for the cash market benchmark, since the only difference between net advisory prices and the cash market benchmark is net futures and options trading profits/losses. The average net advisory price across all quarters is $42.82/cwt., close to the average market benchmark prices over the same period. There are only modest differences in average market benchmark prices; however, there can be substantial differences for individual marketing quarters. The statistics in Table 4 also reveal substantial variation in performance across advisory programs within marketing quarters. The range in net advisory prices averages $5.97/cwt. across all 28 quarters and exceeds $10/cwt. in one quarter (1999:I).

The proportion of advisory programs above each of the three market benchmarks for the first quarter of 1995 through the fourth quarter of 2001 is presented in Table 5. The results reveal substantial variation in the proportion of net advisory prices above the three market benchmarks for individual marketing quarters. For example, in the fourth quarter of 1998, when hogs prices bottomed, 92% of the programs beat the cash benchmark, no programs beat the index benchmark and 67% beat the empirical benchmark. This outcome is feasible given the different amounts of pricing (hedging) incorporated in the index and empirical benchmarks. When prices fall, the index and empirical benchmarks are above the cash benchmark because the short hedges incorporated in the index and empirical benchmarks generate profits, thereby increasing net price. For the fourth quarter of 1998, eight of twelve programs have hedge profits greater than the 20.1% hedge position incorporated in the empirical benchmark. No program has profits greater than the 75% hedge position that is incorporated in the index benchmark. Eleven of the twelve advisory programs have hedging profits greater than zero, so their net prices are above the cash benchmark.

Table 5 also displays average proportions across all programs from the first quarter of 1995 through the fourth quarter of 2001.[12] By analogy to the flips of a fair coin, these average proportions must be greater than 50% in order to "beat the market." The average proportion versus the cash market benchmark is 41%, indicating a lower than average chance that advisory programs will exceed cash benchmark prices. The average proportion versus the index market benchmark is 56%, indicating a slightly

higher than average chance that programs will exceed index benchmark prices. The average proportion versus the empirical market benchmark is 46%, again indicating a lower than average chance that advisory programs will exceed given benchmark prices. Overall, these results suggest the chance of advisory programs "beating the market" in hogs is not high. It is interesting to compare the proportions to those reported in other studies on the performance of market advisory programs and professional investment managers. The proportions for hogs tend to be lower than those reported for market advisory programs in corn and soybeans (Irwin, Martines-Filho and Good), but higher than those found for wheat (Jirik et al.) Malkiel reports that the proportion of active mutual fund managers beating the stock market is only 33%, much lower than what is found in hogs.

Average Price Performance

The performance indicator examined in this section is the average price of advisory programs relative to the average price associated with market benchmarks.[13, 14] Given that risk is not considered, this indicator is strictly applicable only to decision-makers with risk-neutral preferences. While this may seem unrealistic from a theoretical perspective, there is evidence that many producers focus mainly on expected returns, a point emphasized recently by Tomek and Peterson.

A number of different statistical tests can be used to determine the significance of observed differences in sample means. In the present context, it is critical to recognize that there is a "natural" pairing in the sample data that can be used to increase the power of statistical tests (Snedecor and Cochran, pp. 101). More specifically, net advisory prices and benchmark prices for the same marketing quarter are paired, in the sense that the same marketing quarter receives different "treatments" from advisory programs and benchmarks. The treatments correspond to the differing marketing strategies used by advisory programs and benchmarks.

Given that the sample data are paired, the appropriate test of the null hypothesis of zero difference between the mean of net advisory and benchmark prices is the paired *t*-test. First, define the following difference for a given benchmark,

$$r_{it} = NAP_{it} - BP_t \qquad (i = 1,...,N;\ t = 1,...,T) \tag{1}$$

where NAP_{it} is the net price for the i^{th} advisory program in the t^{th} marketing quarter and BP_t is the benchmark price in the t^{th} marketing quarter. The underlying statistical model is,

$$r_{it} = \mu + e_{it} \tag{2}$$

where μ is the expected value (mean) of the difference between the net price for the i^{th} advisory program and the benchmark price and e_{it} is the error term for the i^{th} advisory program in the t^{th} marketing quarter. Note that the model assumes the expected value of

the difference between net advisory prices and the benchmark is the same for all programs and marketing quarters. Three key assumptions typically are made about the error term. The first, $e_{it} \sim N(0, \sigma_i^2)$, implies that errors are normally distributed with an expected value of zero and variance equal to σ_i^2. The second assumption, $\text{cov}(e_{it}, e_{is}) = 0 \ \ \forall t, s$, implies that errors for the same advisory program are independent through time. The third assumption, $\text{cov}(e_{it}, e_{jt}) = 0 \ \ \forall i, j$, implies that errors for the same marketing quarter are independent across advisory programs. Given these assumptions, it is straightforward to test the null hypothesis of no difference in mean price for all programs and marketing quarters pooled together, as a conventional *t*-statistic can be computed and used to infer the significance of observed mean differences.

Before conducting the statistical tests, it is important to investigate if the key assumptions discussed above hold for the available sample of net advisory prices. The first assumption, normality, is tested via the Jarque-Bera test (Bera and Jarque, 1981, 1982). In order to maximize the number of time-series observations available for each program, the sample for this analysis is limited to the nine programs active in all 28 marketing quarters. Test statistics indicate normality is rejected for three advisory programs for differences versus the cash benchmark and none for differences versus the index or empirical benchmarks.[15] Since normality is rejected in relatively few instances, non-normality does not appear to be a serious problem. Furthermore, the *t*-test generally is a conservative (in the sense of controlling the probability of Type I error) and reliable approximation in the cases where normality may not be appropriate (Greene, p. 106). The second assumption implies that advisory program differences versus the benchmarks are independent across marketing quarters. The following section on predictability of performance indicates limited evidence of dependence through time. So, this does not appear to be a serious statistical problem either.

The third assumption implies that advisory program differences versus the benchmarks are independent across programs for a given marketing quarter. Correlations across advisory programs provide evidence on the seriousness of this problem. Again, in order to maximize the number of time-series observations available for each program, the sample is limited to the nine programs active in all 28 marketing quarters. Correlation coefficients are first estimated for net advisory prices. Pair-wise price correlations are all greater than 0.90 and average 0.96. The extremely high price correlations are to be expected, given that advisory prices are all based on the same cash market price series. Correlation coefficients also are estimated for the difference between net advisory price and market benchmark prices. Not surprisingly, correlations are lower for price differences. Average correlations with respect to the cash, index and empirical benchmark are 0.30, 0.66 and 0.09, respectively.[16] While the level varies with each benchmark, the difference estimates suggest that dependence across advisory programs is likely to be a problem in testing the statistical significance of average price performance. This result is not unexpected because many of the programs appear to use similar methods of analysis, and all make heavy use of similar supply and demand information (e.g., USDA *Hogs and Pigs Reports*). Hence, it appears to be inappropriate to assume

that advisory program differences versus the benchmarks are independent across programs.

The implication of incorrectly assuming independence of differences across programs is potentially severe. The reliability of sample mean difference estimates is likely to be overstated, which will in turn bias *t*-tests towards a conclusion that pricing performance is significantly positive (assuming differences are positive on average). A similar statistical problem occurs when testing the capital asset pricing model (CAPM) in the stock market because stock returns tend to be positively correlated across stocks. Fama and MacBeth develop a cross-sectional methodology to address this problem that has been applied in numerous studies of stock returns. In the context of the present study, implementation of the Fama-MacBeth approach involves two steps. The first step is to compute the average net advisory price across all programs active in a marketing quarter and then subtract the benchmark price from this "average" advisory price. Call this difference b_i and repeat the computation for all 28 marketing quarters $(i = 1,...,28)$. Since the underlying differences are assumed to be normally distributed and independent through time, the time-series of 28 b_i will be normally distributed and independent. As a result, the second step is to simply compute the usual *t*-statistic for the time-series of 28 b_i.

The results of the average pricing test are found in Table 6. Differences are presented for each of the 28-quarters, along with the statistics related to the Fama-MacBeth test.[17] The results show that average differences are quite small in nominal terms for all three benchmarks, -$0.41/cwt., $0.00/cwt. and -$0.27/cwt. versus the cash, index and empirical benchmarks, respectively. Average differences can mask considerable variability across the benchmarks within a marketing quarter and across marketing quarters. An example of this occurred in third quarter of 1998, where the average differences range from -$4.86/cwt. for the index benchmark to +$1.83/cwt. for the cash benchmark. Two-tail *p*-values indicate none of the average differences are significantly different from zero at the five percent or lower level of significance, although the average difference versus the empirical benchmark just misses this cutoff. Overall, the test results show that advisory programs as a group do not outperform the market benchmarks in terms of average price.

Further insight into the average pricing results can be found in Figure 3. Each panel plots the time-series of the average difference between advisory programs and a given benchmark (left axis) versus the benchmark price level (right axis). As shown in Panel A of Figure 3, when cash benchmark prices are low there is a tendency for the average difference between advisory programs and the cash benchmark to be positive, and *vice versa*. This reflects positive hedging returns for the advisors when prices are low and negative hedging returns when prices are high. Panel B indicates a completely different pattern for the index market benchmark. The volatility of the index benchmark is substantially lower than the cash benchmark due to the relatively large amount of hedging (75% cumulatively) assumed for index benchmark. For the same reason, average differences versus the index benchmark positively track the level of index

benchmark prices. In other words, the pattern of hedging profits and losses is roughly the same for advisory programs and the index benchmark. As shown in Panel C, the pattern for differences from the empirical benchmark and the level of the empirical benchmark price falls somewhere between that of the cash and index benchmarks. The empirical benchmark is slightly less volatile than the cash benchmark due to the modest amount of hedging assumed for the empirical benchmark. However, the empirical benchmark is more volatile than the index benchmark because the index benchmark assumes a substantially higher level of hedging. While the relationship between average differences and the empirical benchmark are attenuated relative to the cash benchmark, there nonetheless still appears to be a negative relationship between average differences and the empirical benchmark price. Finally, correlations between the average differences and the benchmarks quantify the patterns just discussed. The correlations are -0.78, +0.48 and -0.42 versus the cash, index and empirical market benchmarks prices, respectively.

Average Price and Risk Performance

As noted in the previous section, average price comparisons may not provide a complete picture of performance. For example, two advisory programs can generate the same average advisory price, but the risk of the programs may differ substantially. The difference in risk may be the result of using different pricing tools (cash, forward, futures or options), different timing of sales and variation in the implementation of marketing strategies.

A number of theoretical frameworks have been developed to analyze decision-making under risk. The mean-variance (EV) model is relatively simple and has been widely-applied in the marketing and risk management literature (Tomek and Peterson). To apply the single-period EV model to a particular decision, either distributions of outcomes must be normal or decision-makers must have quadratic utility functions (Hardaker, Huirne and Anderson). If either or both of these conditions hold, then risky choices can be divided into efficient and inefficient sets based on the famous EV efficiency rule: if the mean of choice A is greater than or equal to the mean of choice B, and the variance of A is less than or equal to the variance of B, with at least one strict inequality holding, then A is preferred to B by all risk-averse decision makers. Since quadratic utility has the unlikely characteristic that absolute risk aversion increases with the level of the outcome, application of the EV model usually is based upon an assumption of normally distributed outcomes. This presents a potential problem in the case of market advisory programs that employ options strategies. Such strategies are designed to create non-normal price distributions by truncating undesirable prices, either on the downside or the upside, or both. Simulation analysis suggests that the EV model produces reasonably accurate results even in cases where options strategies are employed (Hanson and Ladd; Ladd and Hanson; Garcia, Adam and Hauser).

The basic data needed for assessing market advisory pricing performance in an EV framework are presented in Table 4. For each advisory program tracked in all 28 marketing quarters, the average net advisory price and standard deviation of net advisory price are reported.[18] The average price and standard deviation of the three benchmarks

also are reported. The sample of advisory programs for the EV analysis is limited to those tracked in all 28 marketing quarters in order to maximize the number of observations available to estimate risk (standard deviation).[19] Average price varies relatively little across the 9 programs, with a low of $41.73/cwt. and a high of $43.77/cwt. The standard deviation estimates suggest that the risk of advisory programs varies more widely, with a low of $7.24/cwt. and a high of $9.61/cwt. The average standard deviation for the 9 programs, $8.34/cwt., is near the middle of the standard deviations for the three market benchmarks.

Just as in the previous section, it is important to consider the level of aggregation for the EV analysis. One possibility is to examine the mean and standard deviation of the "average" advisory program constructed for the average price tests. Unfortunately, this is not a useful concept because the risk of the average program will be smaller than that typically experienced by subscribers to individual advisory programs (due to diversification effects). An alternative is to consider a single "randomly-selected" advisory program (e.g., Elton, Gruber and Rentzler). Such a program reflects both the average price and average risk of individual advisory programs. Estimates for a single randomly-selected program can be found in Table 7 along the row labeled "Average." While this is a useful way to summarize mean-standard deviation results for advisory programs, the difficulty is that an actual time-series of net prices for a randomly-selected program cannot be constructed. This makes it difficult to conduct joint statistical tests for mean-standard deviation dominance.[20] The analysis here will focus on individual programs so that appropriate statistical tests can be conducted. The tradeoff is that aggregation of individual program test results may be problematic due to the positive correlation of net prices across advisory programs. This should be kept in mind when considering summary measures of the number of programs that dominate a particular benchmark.

Mean-standard deviation dominance results for individual programs entail straightforward application of the EV efficiency rule discussed above. Testing the statistical significance of the dominance results is less straightforward. Fortunately, Bradley and Blackwood develop a simultaneous test of the equivalence of means and variances for paired data. The initial step in the development of the test is to define the differences and sums for a given advisory program and benchmark as $D_t = NAP_t - BP_t$ and $S_t = NAP_t + BP_t$. The first variable simply changes the notation used in equation (1). Next, specify the following regression relationship between the differences and sums,

$$D_t = \beta_1 + \beta_2 S_t + e_t . \tag{3}$$

Now assume that net advisory and benchmark prices have a bi-variate normal distribution with a correlation coefficient between -1 and +1. Under this assumption, Bradley and Blackwood show that,

$$\beta_1 = \left(\mu_i - \mu_{BP}\right) - \left[\left(\sigma_i^2 - \sigma_{BP}^2\right) / \sigma_S^2\right] \cdot \left(\mu_i + \mu_{BP}\right) \tag{4}$$

(5) $$\beta_2 = \left(\sigma_i^2 - \sigma_{BP}^2\right) \Big/ \sigma_S^2$$

where μ_i is the mean price for the advisory program, μ_{BP} is the mean price for the benchmark, σ_i^2 is the variance of the advisory program, σ_{BP}^2 is the variance of the benchmark and σ_S^2 is the variance of the sum of advisor and benchmark prices. Note that $\mu_i = \mu_{BP}$ and $\sigma_i^2 = \sigma_{BP}^2$ if and only if $\beta_1 = \beta_2 = 0$. As a result, the simultaneous test of the equivalence of means and variances (standard deviations) can be implemented in two steps. First, run a regression of the relevant differences on the sums. Second, calculate the *F*-statistic for the joint null hypothesis that the intercept (β_1) and slope parameters (β_2) equal zero and compare the test statistic to critical *F*-values.[21]

Mean-standard deviation dominance results for the nine market advisory programs over 1995:I-2001:IV also are presented in Table 7. Following the notational scheme suggested by Hardaker, Huirne and Anderson (p.143), a "+" indicates the average price for an advisory program is higher than the given benchmark and the standard deviation for the program is lower than the given benchmark. In this case, the advisory program exhibits mean-standard deviation dominance of the given benchmark. A "?" indicates the average price for an advisory program is higher (lower) than the given benchmark and the standard deviation for the program is higher (lower) than the given benchmark. In this case, the advisory program does not exhibit mean-standard deviation dominance of the given benchmark, and *vice versa*. A "-" indicates the average price for an advisory program is lower than the given benchmark and the standard deviation for the program is higher than the given benchmark. In this case, the given benchmark exhibits mean-standard deviation dominance of the advisory program. Based on the *F*-statistic from the Bradley-Blackwood regression, two stars indicate statistically significant dominance at the one percent level and one star indicates statistically significant dominance at the five percent level.

The dominance results in Table 7 provide evidence of both positive and negative performance. Three of the nine programs (33%) dominate the cash market benchmark, while the cash benchmark dominates two of the programs (22%). In each of these five cases the dominance is statistically significant. No program (0%) dominates the index market benchmark, while the index benchmark dominates four programs (44%). In two of these latter four cases the dominance is statistically significant. The results for the empirical benchmark are similar to those for the cash benchmark, with three programs dominating the empirical benchmark (33%) and the empirical benchmark dominating two programs (22%). Only one of the three cases of positive dominance by the programs is statistically significant.

Overall, the test results in this section suggest that advisory programs as a group do not outperform the market benchmarks in terms of average price and risk. There are a total of six cases in the comparisons where advisory programs dominate a benchmark, but these are more than offset by the eight cases where a benchmark dominates a program. The most evidence of positive performance is found for the cash and empirical

benchmarks and the least for the index benchmarks. The reason for this result can be seen in Figure 4, where the average price and risk for individual advisory programs and the market benchmarks are plotted. The graphs show that the average price and risk for the cash and empirical benchmarks are quite similar, which, as noted in the previous section, is not a surprise given the relatively small amount of hedging associated with the empirical benchmark. In contrast, the risk of the index benchmark is substantially smaller than either of the other two benchmarks or any of the nine advisory programs due to the relatively large amount of hedging assumed for the index benchmark (75% cumulatively). The substantially smaller risk of the index benchmark is consistent with the evidence from previous studies on hedging with live/lean hog futures. These studies typically find that the amount of hedging should be about 90% to minimize risk (e.g., Matthews and Holthausen).[22]

A key motivation for the EV analysis is to determine whether consideration of risk alters performance conclusions based only on average price. This is best seen by comparing the proportion of advisory programs that beat the benchmarks in terms of average price only with the proportion of programs that dominate the benchmarks in terms of average price and risk. In the case of the cash market benchmark, advisory programs beat the benchmark 41% of the time based on price alone (Table 5). The proportion drops to 33% when risk is considered. Examining the index market benchmark, programs outperform the benchmark 56% of the time based on average price alone, but drop to 0% when risk is considered. When comparisons are made against the empirical benchmark, programs outperform the benchmark 46% of the time based on average price alone, but again drop to 33% when risk is considered. One is left with the clear result that consideration of risk tends to weaken evidence regarding the pricing performance of advisory programs in hogs.

Predictability

Even if, as a group, advisory programs do not outperform market benchmarks, there is a wide range in performance for any given quarter. The average variation across advisory programs within a quarter is substantial, at approximately $6.00/cwt. This raises the question of the predictability of advisory program performance from quarter-to-quarter. The predictability test used in this study is the correlation of advisory program ranks across marketing quarters and years. This testing procedure has been widely used in studies of financial investment performance (e.g., Elton, Gruber and Rentzler) and in earlier studies of market advisory performance (e.g. Irwin, Martines-Filho and Good).[23]

The first step in this testing procedure is to form the sample of all advisory programs that are active in adjacent quarters. The second step is to rank each advisory program in the first quarter of the pair (e.g., t = 1995:I) based on net advisory price. Then the programs are sorted in descending rank order. The third step is to sort and rank the same sample of programs in the second quarter of the pair (e.g., $t + 1$ = 1995:II). The fourth step is to compute the correlation coefficient between the ranks for the two adjacent quarters. If advisory program performance is unpredictable, the estimated

correlation will be near zero. Assuming the standard error of the correlation coefficient is approximately equal to $1/\sqrt{T}$, the appropriate statistical test is a Z-test.

Results of the rank correlation predictability test by quarter are presented in Table 8. Rank correlation coefficients ranged from –0.25 to +0.86. Statistically significant rank correlations are found in only 5 of the 27 quarterly comparisons. Note that the evidence of significant correlations should be viewed cautiously since the reported *p*-values may overstate significance due to dependence across advisory programs. The average rank correlation across all paired comparisons is 0.30, suggesting some predictability in the relative pricing performance market advisory programs in hogs.

While the previous results indicate some evidence of performance predictability across marketing quarters, it may be of little use from an economic standpoint because marketing windows for adjacent quarters overlap by three quarters. For example, a producer selecting an advisory program at the end of the first quarter in 1995 would only be able to fully implement their selection starting with the marketing window for the first quarter of 1996 (which starts at the beginning of 1995:II). Hence, performance would have to persist across four marketing quarters for a producer to fully benefit from predictability.

Results of the rank correlation predictability test for non-overlapping marketing quarters are presented in Table 9. Rank correlation coefficients ranged from –0.69 to +0.43. Only 2 of the 24 correlations are statistically significant and the two significant correlations are negative. Furthermore, the average rank correlation across all paired non-overlapping comparisons is -0.01. These results indicate predictability of pricing performance for advisory programs is short-lived, in the sense that performance does not persist long enough to benefit hog producers.

The predictability results presented so far are all based on individual marketing quarter comparisons. It is possible for performance to be predictable over longer time horizons, but unpredictable over short horizons due to a large amount of "noise" in performance from quarter-to-quarter (e.g., Summers). To assess longer-term predictability, predictability is tested for an annual performance horizon. The first step in this testing procedure is to form the sample of all advisory programs that are active in each marketing quarter for adjacent calendar years. The second step is to average each program's price across the four marketing quarters of the first year of each pair (e.g., t = 1997) and rank each advisory program in the first year of the pair based on average net advisory price. The third step is to average, sort and rank the same sample of programs in the second year of the pair (e.g., $t + 1 = 1998$). The fourth step is to compute the correlation coefficient between the ranks for the two adjacent calendar years. The results are striking, in that the average correlation, 0.05, is quite close to zero and none of the individual correlations are statistically significant.[24] Hence, there is no evidence of longer-term predictability.

Similar to the findings in earlier studies of market advisory performance in corn, soybeans and wheat (Irwin, Martines-Filho and Good; Jirik et al.), the test results

presented in this section provide little evidence that the pricing performance of advisory programs in hogs can be usefully predicted from past performance. However, as Irwin, Martines-Filho and Good point out, this conclusion does not mean it is impossible to predict advisory program performance. There may be other variables that are useful for predicting performance. Chevalier and Ellison study whether mutual fund performance is related to characteristics of fund managers that indicate ability, knowledge or effort, and find that managers who attended higher-SAT undergraduate institutions generate systematically higher returns. Barber and Odean examine the trading records of individual stock investors and report that frequent trading substantially depresses investment returns. Similar factors, such as education of advisors or frequency of futures and options trading may be useful in predicting the performance of market advisory programs in hogs.

Summary and Conclusions

The purpose of this paper is to investigate the pricing performance of agricultural market advisory services for hogs. The data for the study is provided by the Agricultural Market Advisory Service (AgMAS) Project. Pricing recommendations are available for all quarters from the beginning of 1995 through the end of 2001. Since the AgMAS Project subscribes to all of the services and collects "real-time" recommendations, the data is not subject to survivorship bias. Based on these recommendations, the net price that would have been received by a hog producer who precisely follows the set of pricing recommendations is computed. Since cash hog pricing recommendations are often limited and quite short-run in nature, the same cash marketing strategy is assumed for all services. Therefore, the net advisory price is computed as the quarterly average cash sale price plus or minus gains/losses and brokerage costs associated with futures and options transactions. In addition, three market benchmarks are developed for the evaluations.

Analysis of the advisory program marketing recommendations in hogs shows that the most frequently used marketing tool is a futures only position, with every program employing futures in at least one quarter. On average, futures only positions are used in 55.9% of the marketing quarters examined in this study. It is also found that the average amount of pricing previous to a marketing quarter is relatively modest. Across all programs, the average cumulative amount priced at the start of a marketing quarter is only 21.7%. While the amount of pricing is relatively modest on average, there is large variation in the amount priced within marketing quarters, across marketing quarters and across advisory programs. This indicates advisory programs in hogs frequently engage in what Working termed “selective” hedging strategies

Three basic tests of performance are examined for quarterly advisory program prices over 1995:I-2001:IV. The first test compares the average price of advisory programs to the market benchmarks. The results show that average differences between advisory programs and market benchmarks are small in nominal terms for all three benchmarks, -$0.41/cwt., $0.00/cwt. and -$0.27/cwt. versus the cash, index and empirical benchmarks, respectively, and none of the average differences are significantly different

from zero. Hence, advisory programs as a group do not outperform the market benchmarks in terms of average price.

The second test is the average price and risk of advisory programs relative to the market benchmarks. Test results indicate that three of the nine programs dominate the cash market benchmark, no program dominates the index market benchmark and three programs dominate the empirical benchmark. So, there is a total of six cases in the comparisons where advisory programs dominate a benchmark, but these are more than offset by the eight cases where a benchmark dominates a program. Overall, the test results in this section suggest that advisory programs as a group do not outperform the market benchmarks in terms of average price and risk.

The third test is the predictability of advisory program performance from period-to-period. The average rank correlation of advisory program pricing performance across adjacent market quarters is 0.30. However, rank correlations are statistically significant in only 5 of the 27 comparisons. Even this modest level of predictability may be of little use from an economic standpoint because marketing windows for adjacent quarters overlap. More specifically, the average rank correlation across all paired non-overlapping comparisons is only -0.01. These results indicate that any predictability of pricing performance for advisory programs is short-lived, in the sense that performance does not persist long enough to benefit hog producers.

In conclusion, the results provide a reasonably clear picture of the performance of market advisory programs in hogs. There is little evidence that advisory programs as a group outperform market benchmarks, especially after considering risk. This supports the view that hogs markets (cash, futures and options) are efficient with respect to the types of marketing strategies available to producers (e.g., Zulauf and Irwin). Market advisory services (as a group) do not appear to have access to information not available to other hog market participants and/or superior analytical skills. In addition, there is little evidence that advisory programs in hogs with superior performance can be usefully selected based on past performance.

References

Baillie, R.T. and R.J. Myers. "Bivariate Garch Estimation of the Optimal Commodity Futures Hedge," *Journal of Applied Econometrics,* 6(1991):109-124.

Barber, B.M. and T. Odean. "Trading is Hazardous to Your Wealth: The Common Stock Investment Performance of Individual Investors." *Journal of Finance*, 55(2000):773-806.

Bera, A. and C. Jarque. "Efficient Tests for Normality, Heteroscedasticity and Serial Independence of Regression Residuals: Monte Carlo Evidence." *Economics Letters*, 7(1981):313-318.

Bera, A. and C. Jarque. "Model Specification Tests: A Simultaneous Approach." *Journal of Econometrics*, 20(1982):59-82.

Bertoli, R., C.R. Zuluaf, S.H. Irwin, T.E. Jackson and D.L. Good. "The Marketing Style of Advisory Services for Corn and Soybeans in 1995." AgMAS Project Research Report 1999-02, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, August 1999.

Bradley, E.L. and L.G. Blackwood. "Comparing Paired Data: A Simultaneous Test for Means and Variances." *American Statistician*, 43(1989):234-235.

Brown, G.W. and Z. Khokher. "Corporate Hedging with a View." Unpublished Working Paper, Kenan-Flagler Business School, University of North Carolina at Chapel-Hill, November 2000.

Brown, G.W., P.R. Crabb and D. Haushalter. "Are Firms Successful at "Selective Hedging?" Unpublished Working Paper, Kenan-Flagler Business School, University of North Carolina at Chapel-Hill, October 2001.

Brown, S.J., W.N. Goetzmann, R.G. Ibbotson and S.A. Ross. "Survivorship Bias in Performance Studies." *Review of Financial Studies,* 5(1992):553-580.

Brown, S.J., W.N. Goetzmann and R.G. Ibbotson. "Offshore Hedge Funds: Survival and Performance, 1989-95." *Journal of Business,* 72(1999):91-117.

Chevalier, J. and G. Ellison. "Are Some Mutual Fund Managers Better Than Others? Cross-Sectional Patterns in Behavior and Performance." *Journal of Finance*, 54(1999):875-899.

Collender, R.N. "Estimation Risk in Farm Planning Under Risk." *American Journal of Agricultural Economics*, 71(1989):996-1002.

Daniel, K.D., D. Hirshleifer and A. Subrahmanyam. "Investor Psychology and Security Market Over- and Underreactions." *Journal of Finance*, 53(1998):1839-1886.

Elton, E. J., M. J. Gruber and J. C. Rentzler. "Professionally Managed, Publicly Traded Commodity Funds." *Journal of Business*, 60(1987):175-199.

Fama, E. "Efficient Capital Markets: A Review of Theory and Empirical Work." *Journal of Finance*, 25(1970):383-417.

Fama, E.F. and J.D. MacBeth. "Risk, Return and Equilibrium: Empirical Tests." *Journal of Political Economy*, 81(1973):607-636.

Garcia, P., B.D. Adam and R.J. Hauser. "The Use of Mean-Variance for Commodity Futures and Options Hedging Decisions." *Journal of Agricultural and Resource Economics*, 19(1994):32-45.

Gehrt, D. and Good. "Evaluation of Market Advisory Services for Corn and Soybeans." *Journal of the American Society of Farm Managers and Rural Appraisers*, 57(1993):1-7.

Greene, W.H. *Econometric Analysis, Fifth Edition*. Prentice Hall: Upper Saddle River, New Jersey, 2003.

Hanson, S.D. and G.W. Ladd. "Robustness of the Mean-Variance Model with Truncated Probability Distributions." *American Journal of Agricultural Economics*, 73(1991):436-45

Hardaker, J.B., R.B.M. Huirne and J.R. Anderson. *Coping with Risk in Agriculture*. CAB International: New York, 1997.

Hull, J.C. *Options, Futures and Other Derivatives, Fourth Edition*. Prentice Hall: Upper Saddle River, New Jersey, 2000.

Irwin, S.H., J. Martines-Filho and D.L. Good. "The Pricing Performance of Market Advisory Services in Corn and Soybeans Over 1995-2000," AgMAS Project Research Report 2002-01, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, April 2002.

Jirik, M.A., S.H. Irwin, D.L. Good, T.E. Jackson and J. Martines-Filho. "The 1995 Through 1998 Pricing Performance of Market Advisory Services for Wheat," AgMAS Project Research Report 2000-02, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, June 2000. (http://www.farmdoc.uiuc.edu/agmas/reports/index.html)

Ladd, G.W. and S.D. Hanson. "Price Risk Management with Options: Optimal Market Positions and Institutional Value." *Journal of Futures Markets*, 11(1991):737-750.

Lei, L.F., D. Liu and A. Hallam. "Solving for Optimal Futures and Options Positions Using a Simulation-Optimization Technique." *Journal of Futures Markets*, 15(1995):559-571.

Malkiel, B.G. "Returns from Investing in Equity Mutual Funds 1971 to 1991." *Journal of Finance*, 50(1995):549-572.

Martines-Filho, J. *Pre-Harvest Marketing Strategies for Corn and Soybeans: A Comparison of Optimal Hedging Models and Market Advisory Service Recommendations*. Unpublished Ph.D. Dissertation, The Ohio State University, 1996.

Matthews, K.H. and D.M. Holthausen. "A Simple Multiperiod Minimum Risk Hedge Model." *American Journal of Agricultural Economics*, 73(1991):996-1026.

McKenzie, A.M. and M.T. Holt. "Market Efficiency in Agricultural Futures Markets." *Applied Economics*, 34(2002):1519-1532.

Patrick, G.F., A.E. Baquet, K.H. Coble and T.O. Knight. "Hog Risk Management Survey: Summary and Preliminary Analysis," Staff Paper #00-9, Department of Agricultural Economics, Purdue University, October 2000.

Pennings, J.M.E., D.L. Good, S.H. Irwin and J.K. Gomez. "The Role of Market Advisory Services in Crop Marketing and Risk Management: A Preliminary Report of Survey Results," AgMAS Project Research Report 2001-02, Department of Agricultural and Consumer Economics, University of Illinois at Urbana-Champaign, March 2001. (http://www.farmdoc.uiuc.edu/agmas/reports/index.html)

Schroeder, T.C., J.L. Parcell, T.L. Kastens and K.C. Dhuyvetter. "Perceptions of Marketing Strategies; Farmers vs. Extension Economists." *Journal of Agricultural and Resource Economics*, 23(1998):279-293.

Schneeweis, T., D. McCarthy and R. Spurgin. "Survivor Bias in Commodity Trading Advisor Performance." *Journal of Futures Markets*, 16(1996):757-772

Snedecor, G.W. and W.G. Cochran. *Statistical Methods, Eighth Edition*. Iowa State Press: Ames, Iowa, 1989.

Stulz, R. "Rethinking Risk Management." *Journal of Applied Corporate Finance*, 9(1996):8-24.

Summers, L.H. "Does the Stock Market Rationally Reflect Fundamental Values?" *Journal of Finance*, 41(1986):591-601.

Tomek, W.G. and H.H. Peterson. "Risk Management in Agricultural Markets: A Review." *Journal of Futures Markets*, 21(2001):853-985.

Webber, R.L. *Evaluation of Market Advisory Service Performance in Hogs*. Unpublished M.S. Thesis, University of Illinois at Urbana-Champaign, 2003.

Ward, K. "Mandatory Price Reporting Creates Confusion in Markets." Kansas State University Research and Extension News, May 9, 2001. (http://www.oznet.ksu.edu/news/sty/2001/cattle_MPR501.htm)

Working, H. "New Concepts Concerning Futures Markets and Prices." *American Economic Review*, 52(1962):432-459.

Zulauf, C.R. and S.H. Irwin. "Market Efficiency and Marketing to Enhance Income of Crop Producers." *Review of Agricultural Economics*, 20(1998):308-331.

Endnotes

[1] When the AgMAS study began in 1994, DTN and FarmDayta were separate companies. The two companies merged in 1996.

[2] Of the advisory programs tracked by the AgMAS Project, a smaller number provide marketing recommendations for hogs as compared to grains. For example, a total of 39 and 38 advisory service programs for corn and soybeans, respectively, have been included in the 1995-2001 sample at some point in time. It appears that more advisory services focus on the grain markets than the livestock markets.

[3] The combination category includes quarters where futures and options positions are used simultaneously and where they are used separately in the same quarter.

[4] The definition of delta is the dollar amount that the value of a position changes for a one unit increase in the price of the underlying commodity.

[5] A detailed explanation of the construction of marketing profiles can be found in Webber.

[6] Quarterly average marketing profiles for individual market advisory programs are found in Webber.

[7] A similar type of behavior has been frequently observed in the risk management programs of financial and non-financial corporations, where it is labeled "hedging with a view" (Stulz; Brown and Khokher; Brown, Crabb and Haushalter).

[8] There are exceptions. Baille and Myers present estimates of optimal hedge ratios for several commodities that allow for time-varying risk estimates. Some of the plots of the estimated optimal hedge ratios indicate substantial time-series variation in optimal hedge ratios due to time-varying risk alone.

[9] A consistent live-weight cash price series is not available for the Iowa/Minnesota spot market for the entire 1995-2001 sample due to complications associated with the change to a mandatory price reporting system (Ward). For a period in 2000, live-weight cash prices actually were not reported. In order to create a consistent live-weight series, Iowa/Minnesota carcass prices are converted to a live-weight basis. This carcass price series is available for the entire sample period and is computed as the quarterly average carcass price for barrows and gilts recorded each Wednesday during the marketing quarter. These prices are obtained from the Kansas State University livestock marketing web page (http://www.agecon.ksu.edu/livestock). Carcass prices are converted to a live-weight basis by multiplying each price by a conversion factor of 0.74. We are indebted to James Mintert of Kansas State University for suggesting this procedure to obtain live-weight prices.

[10] Behavioral market theory suggests that the average return actually achieved by a significant number of market participants may be less than that predicted by efficient market theory, due to the judgment and decision biases that plague these participants (e.g., Daniel, Hirshleifer and Subrahmanyam). As a result, the average return actually received by the relevant group of market participants also becomes an appropriate benchmark. Based on this argument, Irwin, Martines-Filho and Good specify a behavioral benchmark that measures the average price actually received by farmers for corn and soybeans. A comparable "farmer" benchmark is not specified in hogs due to the difficulty of specifying such a benchmark that is comparable to net advisory prices. First, there are wide differences in pricing mechanisms and premiums/discounts for grade and quality across hog producers that are not likely fully reflected in the available USDA price received series for hogs. Second, USDA average price received series are only available on a state average basis, whereas the cash price series used in this study is based on Iowa/Minnesota area prices. In sum, unlike the situation in corn and soybeans, it is appears to be unreasonable to argue that the USDA price received series can be used as the basis for constructing a useful farmer benchmark in hogs.

[11] Weaker versions of the theory of efficient markets predict advisory services may profit to the degree they have superior access to information and/or superior analytical ability (e.g., Zulauf and Irwin). While logically appealing, it is quite difficult, if not impossible, to specify market benchmarks based on weaker versions of the theory because it requires knowledge of the average access to information and analytical ability of market participants.

[12] These averages do not necessarily equal the average of the individual quarter averages. This "grand" average equally weights the net advisory prices in the sample, which implies an equal probability of randomly selecting an individual advisory program across the sample. An average of the individual marketing quarter averages equally weights the marketing quarters. This is a subtle, but potentially important, difference.

[13] When considering performance results, it is useful to note that hog producers subscribe to the market advisory programs for a variety of reasons. In a national survey, Pennings et al. find that the two highest rated uses for market advisory programs by farmer-subscribers are market information and market analysis. Although it is likely that the quality of the marketing information and analysis is highly correlated with the returns to marketing recommendations, this may not be the case. It is feasible for a program to provide helpful information and analysis to producer-subscribers, while failing to exhibit superior pricing performance.

[14] It should be stressed the tests presented in this section examine performance of market advisory programs as a group. It is possible for the advisory programs, as a group, to fail to beat the market benchmarks, yet some programs may still show "exceptional" or "inferior" performance. Statistical tests are conducted for the nine programs tracked over the entire 1995:I-2001:IV sample. Net prices for three advisory programs are significantly below the cash and empirical market benchmarks. No program had net prices significantly above either the cash or empirical benchmark. No individual program had net prices significantly above or below the index benchmark. These results are available from the authors upon request.

[15] The normality test results are available from the authors upon request.

[16] The full set of correlation results is available from the authors upon request.

[17] Differences are calculated as advisory price minus benchmark price. So, a positive difference indicates an advisory price above the benchmark price, and *vice versa*.

[18] Standard deviation is substituted for variance as an estimate of risk because it easier to understand. Performance results are the same whether standard deviation or variance is used to estimate risk (Hardaker, Huirne and Anderson, p.143), hence the use of the simpler measure.

[19] The restriction means that only advisory programs active all 28 marketing quarters are included in the average price and risk evaluation. As a result, there is the potential for survivorship bias in the average price and risk comparisons to the benchmarks. Survivorship bias in the average estimates appears to be non-existent, as the average price across the 9 programs is actually 5 cents less than the average price computed across all advisory programs active in the 1995-2001 sample period (Table 4). It is difficult to assess the degree of survivorship bias in advisory program standard deviation estimates given the small number of observations available for the programs not included for the full sample. However, the average price comparisons suggest this bias is likely to be quite small or negligible.

[20] It is possible to conduct separate mean and standard deviation tests for a randomly-selected program and then combine the results based on a bounds condition (Collender). However, such procedures ignore the paired nature of advisory program and benchmark data, which would lead to tests with little or no power to reject the null hypothesis (Snedecor and Cochrane, p. 101).

[21] Jarque-Bera tests indicate that normality of net advisory prices is rejected for three advisory programs for differences versus the cash benchmark and none for differences versus the index or empirical benchmarks. Like the *t*-test, the *F*-test can be justified as a conservative and reliable approximation in cases where normality is rejected (Greene, p. 108).

[22] The results also are interesting to consider in light of previous evidence regarding risk premiums in live/lean hog futures prices. For example, McKenzie and Holt find that live hog futures prices typically increase about two percent over a two-month horizon ("normal backwardation"). The lower average prices for the empirical and index benchmarks are consistent with the existence of positive risk premiums that are a cost to short hedgers.

[23] Irwin, Martines-Filho and Good also use winner/loser contingency table tests and high-low quantile tests of predictability. Both of these tests require that the sample of available programs be subdivided into different categories. Doing so in the present case would create categories with as few as three programs. This may result in quite inaccurate estimates of performance for the different categories, and therefore, such tests are not attempted for hogs.

[24] In order to maximize the number of years available for testing, this analysis is based on overlapping marketing windows. Similar results are found for tests based upon non-overlapping years. These results are available from the authors upon request.

Table 1. Market Advisory Programs Tracked by the AgMAS Project in Hogs, 1995:I - 2001:IV Marketing Quarters

Market Advisory Program	First Marketing Quarter Evaluated	Last Marketing Quarter Evaluated	Comment
Ag Profit by Hjort	1995:I	2000:IV	Went out of business at the end of August 2000.
Ag Review	1995:I	2001:IV	Included for all marketing quarters to date.
AgLine by Doane	1995:I	2001:IV	Included for all marketing quarters to date.
AgResource	1995:I	2001:IV	Included for all marketing quarters to date.
AgriVisor (aggressive hedge)	1995:I	2001:IV	Included for all marketing quarters to date.
AgriVisor (basic hedge)	1995:I	2001:IV	Included for all marketing quarters to date.
Brock	1995:I	2001:IV	Included for all marketing quarters to date.
Grain Field Report	1995:I	1995:IV	Stopped providing specific recommendations and dropped after 1995.
North American Ag	1995:I	1995:IV	Stopped providing specific recommendations and dropped after 1995.
Pro Farmer	1995:I	2001:IV	Included for all marketing quarters to date.
Progressive Ag	1996:I	2001:IV	Established service first tracked for the 1996 crop year.
Prosperous Farmer	1995:I	1995:IV	Stopped providing specific recommendations and dropped after 1995.
Stewart-Peterson Advisory Reports	1995:I	2001:IV	Included for all marketing quarters to date.
Top Farmer Intelligence	1995:I	2001:IV	Included for all marketing quarters to date.
Utterback Marketing Services	1997:I	2001:IV	Previous to 1997, did not make clear enough recommendations to be tracked.

Table 2. Frequency of Marketing Tool Use by Individual Market Advisory Programs in Hogs, 1995:I - 2001:IV Marketing Quarters

	Marketing Tool				
Market Advisory Program	Futures Only	Options Only	Combination of Futures and Options	No Futures or Options	Total
Panel A: Number of Quarters			--- # ---		
Ag Profit by Hjort	21	0	0	3	24
Ag Review	23	0	4	1	28
AgLine by Doane	19	4	0	5	28
AgResource	2	10	8	8	28
AgriVisor (aggressive hedge)	15	0	9	4	28
AgriVisor (basic hedge)	19	0	5	4	28
Brock	23	1	4	0	28
Pro Farmer	19	1	2	6	28
Progressive Ag	3	0	11	10	24
Stewart-Peterson Advisory Reports	11	3	14	0	28
Top Farmer Intelligence	22	1	5	0	28
Utterback Marketing Services	2	2	14	2	20
Average	15	2	6	4	27
Panel B: Percentage of Quarters			---%---		
Ag Profit by Hjort	87.5	0.0	0.0	12.5	100
Ag Review	82.1	0.0	14.3	3.6	100
AgLine by Doane	67.9	14.3	0.0	17.9	100
AgResource	7.1	35.7	28.6	28.6	100
AgriVisor (aggressive hedge)	53.6	0.0	32.1	14.3	100
AgriVisor (basic hedge)	67.9	0.0	17.9	14.3	100
Brock	82.1	3.6	14.3	0.0	100
Pro Farmer	67.9	3.6	7.1	21.4	100
Progressive Ag	12.5	0.0	45.8	41.7	100
Stewart-Peterson Advisory Reports	39.3	10.7	50.0	0.0	100
Top Farmer Intelligence	78.6	3.6	17.9	0.0	100
Utterback Marketing Services	10.0	10.0	70.0	10.0	100
Average	55.9	6.9	23.8	13.4	100

Note: Advisory programs with one year or less of data are excluded to minimize the impact of programs that have only few positions.

Table 3. Descriptive Statistics for Net Amount Priced by Market Advisory Programs for Hogs, Selected Dates, 1995:I - 2001:IV Marketing Quarters

Market Advisory Program	Net Amount Priced Prior to Start of Marketing Quarter			
	9-months	6-months	3-months	0-months
			---%---	
Panel A: Average Net Amount Priced				
Ag Profit by Hjort	6.2	12.5	18.1	22.6
Ag Review	0.0	0.0	4.4	19.3
AgLine by Doane	4.5	11.9	22.3	31.6
AgResource	0.0	1.2	8.1	14.7
AgriVisor (aggressive hedge)	6.4	10.7	14.7	21.5
AgriVisor (basic hedge)	4.9	8.1	11.1	17.6
Brock	3.6	13.4	27.0	31.1
Pro Farmer	0.9	5.4	14.3	19.7
Progressive Ag	6.6	7.4	15.0	13.8
Stewart-Peterson Advisory Reports	1.2	8.1	10.4	20.7
Top Farmer Intelligence	1.2	10.5	18.0	17.3
Utterback Marketing Services	0.0	2.2	17.2	30.5
All Programs	3.0	7.6	15.0	21.7
Panel B. Minimum Net Amount Priced				
Ag Profit by Hjort	0.0	0.0	0.0	0.0
Ag Review	0.0	0.0	-50.0	0.0
AgLine by Doane	0.0	0.0	0.0	0.0
AgResource	0.0	0.0	-17.1	-41.4
AgriVisor (aggressive hedge)	0.0	0.0	0.0	0.0
AgriVisor (basic hedge)	0.0	0.0	0.0	0.0
Brock	0.0	0.0	0.0	0.0
Pro Farmer	0.0	0.0	0.0	0.0
Progressive Ag	0.0	0.0	0.0	0.0
Stewart-Peterson Advisory Reports	0.0	0.0	0.0	-100.0
Top Farmer Intelligence	0.0	0.0	0.0	0.0
Utterback Marketing Services	0.0	0.0	0.0	0.0
All Programs	0.0	0.0	-50.0	-100.0
Panel C: Maximum Net Amount Priced				
Ag Profit by Hjort	50.0	51.6	78.3	63.3
Ag Review	0.0	0.0	50.0	81.2
AgLine by Doane	50.0	50.0	75.0	100.0
AgResource	0.0	25.3	66.7	83.3
AgriVisor (aggressive hedge)	66.0	66.0	66.0	110.0
AgriVisor (basic hedge)	50.0	50.0	50.0	100.0
Brock	50.0	50.0	85.1	75.0
Pro Farmer	25.0	50.0	75.0	89.0
Progressive Ag	75.0	75.0	100.6	102.1
Stewart-Peterson Advisory Reports	33.3	100.0	100.0	100.0
Top Farmer Intelligence	33.3	100.0	100.0	101.6
Utterback Marketing Services	0.0	40.0	64.4	100.0
All Programs	75.0	100.0	100.6	110.0

Note: Advisory programs with one year or less of data are excluded to minimize the impact of programs that have only a few positions. The 0-month statistics are based on the day prior to the beginning of the marketing quarter.

Table 4. Descriptive Statistics for Market Advisory Program Pricing Results in Hogs, 1995:I - 2001:IV Marketing Quarters

		Net Advisory Price				Market Benchmark Price		
Quarter	Number of Programs	Average	Minimum	Maximum	Range	Cash	Index	Empirical
			---$/cwt.---				---$/cwt.---	
1995:I	13	38.08	36.25	39.07	2.82	38.73	38.70	38.72
1995:II	13	39.09	35.98	41.02	5.04	39.41	39.20	39.34
1995:III	13	47.05	44.79	49.59	4.81	49.01	46.56	48.34
1995:IV	13	41.84	39.11	43.32	4.21	43.42	40.49	42.64
1996:I	11	45.82	42.73	47.37	4.63	46.36	44.99	46.01
1996:II	11	51.42	47.42	54.53	7.11	54.76	47.92	52.56
1996:III	11	54.73	49.52	57.04	7.52	58.01	52.28	56.45
1996:IV	11	53.58	47.26	55.78	8.52	54.91	51.63	54.21
1997:I	12	51.80	49.56	54.06	4.50	51.50	51.19	51.42
1997:II	12	56.15	54.27	59.02	4.75	56.44	52.96	55.32
1997:III	12	54.51	52.70	56.05	3.35	55.05	52.51	54.36
1997:IV	12	43.66	41.47	46.20	4.73	44.35	47.89	45.30
1998:I	12	36.19	34.19	39.87	5.68	34.79	40.28	36.20
1998:II	12	40.16	38.11	43.37	5.26	39.38	41.21	39.97
1998:III	12	35.73	32.88	42.49	9.60	33.89	40.59	35.71
1998:IV	12	24.13	19.51	28.24	8.73	20.34	30.02	22.94
1999:I	12	27.11	19.88	30.41	10.53	26.10	29.22	26.90
1999:II	12	34.45	31.97	38.40	6.43	33.85	33.35	33.69
1999:III	12	36.45	31.74	41.29	9.55	35.46	41.32	37.05
1999:IV	12	35.70	31.15	38.26	7.12	36.37	36.21	36.33
2000:I	12	38.50	36.14	40.85	4.71	40.31	37.20	39.51
2000:II	12	47.70	43.71	51.06	7.35	49.97	44.56	48.23
2000:III	12	46.22	43.89	48.02	4.14	45.78	47.04	46.12
2000:IV	12	40.09	38.18	41.03	2.85	39.87	39.89	39.88
2001:I	11	41.64	38.67	43.09	4.43	41.92	38.75	41.10
2001:II	11	49.99	45.97	52.43	6.46	51.94	47.36	50.47
2001:III	11	48.93	44.25	51.27	7.02	50.94	46.33	49.69
2001:IV	11	38.25	36.67	42.08	5.41	37.62	39.20	38.04
Average		42.82	39.57	45.54	5.97	43.23	42.82	43.09

Note: The cash benchmark price is the Iowa/Minnesota quarterly average price. The index benchmark price consists of the cash benchmark price plus gains/losses associated with pricing 75% of production over the 9-month period prior to the marketing quarter. Hedges are lifted once a month during the marketing quarter. The empirical benchmark price is similar to the index benchmark price, except a substantially lower amount of production is priced prior to the marketing quarter. This reflects the actual pricing behavior of market advisory programs during the sample period.

Table 5. Proportion of Advisory Programs above Market Benchmarks in Hogs, 1995:I - 2001:IV Marketing Quarters

Marketing Quarter	Number of Programs	Proportion of Programs Above Benchmark		
		Cash	Index	Empirical
			--- % ---	
1995:I	13	23	54	38
1995:II	13	38	62	46
1995:III	13	8	46	23
1995:IV	13	0	92	31
1996:I	11	18	91	36
1996:II	11	0	91	45
1996:III	11	0	73	36
1996:IV	11	27	91	64
1997:I	12	67	83	75
1997:II	12	42	100	75
1997:III	12	33	100	58
1997:IV	12	25	0	17
1998:I	12	83	0	33
1998:II	12	92	17	33
1998:III	12	67	8	33
1998:IV	12	92	0	67
1999:I	12	75	33	50
1999:II	12	50	83	58
1999:III	12	50	0	33
1999:IV	12	42	42	42
2000:I	12	25	75	33
2000:II	12	17	75	50
2000:III	12	50	33	50
2000:IV	12	50	50	50
2001:I	11	64	91	82
2001:II	11	18	82	55
2001:III	11	27	73	45
2001:IV	11	64	27	36
Average		41	56	46

Note: Average proportions for 1995 - 2001 are computed over a full data set of advisory programs. As a result, averages of individual quarter proportions may not equal the average proportions reported for 1995 - 2001. The cash benchmark price is the Iowa/Minnesota quarterly average price. The index benchmark price consists of the cash benchmark price plus gains/losses associated with pricing 75% of production over the 9-month period prior to the marketing quarter. Hedges are lifted once a month during the marketing quarter. The empirical benchmark price is similar to the index benchmark price, except a substantially lower amount of production is priced prior to the marketing quarter. This reflects the actual pricing behavior of market advisory programs during the sample period.

Table 6. Average Pricing Performance Results for Market Advisory Programs in Hogs, 1995:I - 2001:IV Marketing Quarters

	Difference Between Average Advisory Program and Market Benchmarks		
Marketing Quarter	**Cash**	**Index**	**Empirical**
		---$ per cwt.---	
1995:I	-0.66	-0.63	-0.65
1995:II	-0.32	-0.12	-0.26
1995:III	-1.96	0.49	-1.29
1995:IV	-1.58	1.35	-0.79
1996:I	-0.54	0.83	-0.19
1996:II	-3.34	3.50	-1.14
1996:III	-3.28	2.45	-1.72
1996:IV	-1.33	1.95	-0.63
1997:I	0.30	0.61	0.38
1997:II	-0.30	3.19	0.83
1997:III	-0.54	2.00	0.15
1997:IV	-0.69	-4.23	-1.64
1998:I	1.40	-4.09	-0.01
1998:II	0.78	-1.05	0.19
1998:III	1.83	-4.86	0.02
1998:IV	3.79	-5.88	1.20
1999:I	1.01	-2.12	0.20
1999:II	0.61	1.10	0.76
1999:III	0.99	-4.87	-0.60
1999:IV	-0.67	-0.51	-0.63
2000:I	-1.81	1.30	-1.01
2000:II	-2.28	3.14	-0.53
2000:III	0.44	-0.82	0.10
2000:IV	0.22	0.20	0.22
2001:I	-0.27	2.89	0.54
2001:II	-1.95	2.63	-0.47
2001:III	-2.01	2.60	-0.75
2001:IV	0.63	-0.94	0.21
Average Difference	-0.41	0.00	-0.27
Standard Deviation	1.58	2.71	0.73
t -statistic	-1.38	0.01	-1.96
Two-tail *p* -value	0.18	0.99	0.06

Note: The cash benchmark price is the Iowa/Minnesota quarterly average price. The index benchmark price consists of the cash benchmark price plus gains/losses associated with pricing 75% of production over the 9-month period prior to the marketing quarter. Hedges are lifted once a month during the marketing quarter. The empirical benchmark price is similar to the index benchmark price, except a substantially lower amount of production is priced prior to the marketing quarter. This reflects the actual pricing behavior of market advisory programs during the sample period. Two stars indicates significance at the one percent level and one star indicates significance at the five percent level.

Table 7. Average, Standard Deviation and Mean-Variance Dominance Results for Nine Market Advisory Programs in Hogs, 1995:I - 2001:IV Marketing Quarters

Market Advisory Program	Average	Standard Deviation	Dominance versus Benchmark		
			Cash	Index	Empirical
		---$/cwt.---			
Ag Review	42.37	9.61	- *	- **	- **
AgLine by Doane	42.35	7.24	?	-	?
AgResource	43.43	8.57	+ **	?	?
AgriVisor (aggressive hedge)	43.00	8.29	?	?	?
AgriVisor (basic hedge)	43.12	8.37	?	?	+
Brock	41.96	8.20	?	- **	?
Pro Farmer	43.24	7.38	+ **	?	+ *
Stewart-Peterson Advisory Reports	41.73	9.44	- **	-	- *
Top Farmer Intelligence	43.77	7.99	+ *	?	+
Average	42.77	8.34			
Benchmark				Total Count	
Cash	43.23	9.38	3	0	3
Index	42.82	6.56	4	5	4
Empirical	43.09	8.49	2	4	2

Note: The cash benchmark price is the Iowa/Minnesota quarterly average price. The index benchmark price consists of the cas benchmark price plus gains/losses associated with pricing 75% of production over the 9-month period prior to the marketing quarter. Hedges are lifted once a month during the marketing quarter. The empirical benchmark price is similar to the index benchmark price, except a substantially lower amount of production is priced prior to the marketing quarter. This reflects the actual pricing behavior of market advisory programs during the sample period. A "+" indicates the average price for an advisory program is higher than the given benchmark and the standard deviation for the program is lower than the given benchmark. In this case, the advisory program exhibits mean-standard deviation dominance of the given benchmark. A "?" indicates the average price for an advisory program is higher (lower) than the given benchmark and the standard deviation for the program is higher (lower) than the given benchmark. In this case, the advisory program does not exhibit mean-standard deviation dominance of the given benchmark, and vice versa. A "-" indicates the average price for an advisory program is lower than the given benchmark and the standard deviation for the program is higher than the given benchmark. In this case, the given benchmark exhibits mean-standard deviation dominance of the advisory program. Two stars indicates statistically significant dominance at the one percent level and one star indicates significant dominance at the five percent level.

Table 8. Predictability of Market Advisory Program Performance by Rank Between Adjacent Pairs of Marketing Quarters in Hogs, 1995:I - 2001:IV Marketing Quarters

Quarter *t*	Quarter *t+1*	Number of Observations	Correlation Coefficient	*Z*-statistic	Two-tail *p*-value
1995:I	1995:II	12	0.40	1.45	0.15
1995:II	1995:III	12	0.26	0.93	0.35
1995:III	1995:IV	12	0.63 **	2.26	0.02
1995:IV	1996:I	9	0.58	1.82	1.82
1996:I	1996:II	10	-0.25	-0.81	0.42
1996:II	1996:III	10	0.55	1.84	0.07
1996:III	1996:IV	10	0.52	1.72	0.09
1996:IV	1997:I	10	0.06	0.21	0.83
1997:I	1997:II	11	0.06	0.22	0.83
1997:II	1997:III	11	0.33	1.14	0.25
1997:III	1997:IV	11	0.86 **	2.98	0.00
1997:IV	1998:I	11	0.04	0.15	0.88
1998:I	1998:II	11	0.08	0.27	0.79
1998:II	1998:III	11	0.49	1.70	0.09
1998:III	1998:IV	11	0.47	1.62	0.10
1998:IV	1999:I	11	0.41	1.43	0.15
1999:I	1999:II	11	0.29	1.02	0.31
1999:II	1999:III	11	0.51	1.77	0.08
1999:III	1999:IV	11	-0.30	-1.04	0.30
1999:IV	2000:I	11	0.04	0.15	0.88
2000:I	2000:II	11	0.57 *	1.99	0.05
2000:II	2000:III	11	-0.41	-1.43	0.15
2000:III	2000:IV	11	0.32	1.11	0.27
2000:IV	2001:I	10	0.79 **	2.62	0.01
2001:I	2001:II	10	0.07	0.24	0.81
2001:II	2001:III	10	0.64 *	2.11	0.03
2001:III	2001:IV	10	0.08	0.27	0.79
	Average		0.30		

Note: Two stars indicates significance at the one percent level and one star indicates significance at the fiv percent level.

Table 9. Predictability of Market Advisory Program Performance by Rank Between Adjacent Pairs of Non-Overlapping Marketing Quarters in Hogs, 1995:I - 2001:IV Marketing Quarters

Quarter *t*	Quarter *t+1*	Number of Observations	Correlation Coefficient	*Z*-statistic	Two-tail *p*-value
1995:I	1996:I	9	0.25	0.79	0.43
1995:II	1996:II	9	-0.03	-0.10	0.92
1995:III	1996:III	9	0.33	1.05	0.29
1995:IV	1996:IV	9	0.09	0.29	0.77
1996:I	1997:I	11	-0.16	-0.54	0.59
1996:II	1997:II	11	0.32	1.06	0.29
1996:III	1997:III	11	-0.01	-0.03	0.98
1996:IV	1997:IV	11	-0.25	-0.84	0.40
1997:I	1998:I	12	-0.69 *	-2.37	0.02
1997:II	1998:II	12	0.27	0.92	0.36
1997:III	1998:III	12	0.38	1.31	0.19
1997:IV	1998:IV	12	0.35	1.21	0.23
1998:I	1999:I	12	-0.13	-0.44	0.66
1998:II	1999:II	12	-0.16	-0.56	0.58
1998:III	1999:III	12	0.16	0.56	0.58
1998:IV	1999:IV	12	-0.20	-0.68	0.50
1999:I	2000:I	12	-0.57 *	-1.99	0.05
1999:II	2000:II	12	-0.09	-0.31	0.75
1999:III	2000:III	12	-0.48	-1.67	0.09
1999:IV	2000:IV	12	-0.22	-0.75	0.45
2000:I	2001:I	11	0.11	0.36	0.72
2000:II	2001:II	11	-0.09	-0.30	0.76
2000:III	2001:III	11	0.43	1.42	0.16
2000:IV	2001:IV	11	0.08	0.27	0.79
Average			-0.01		

Note: Two stars indicates significance at the one percent level and one star indicates significance at the fiv
percent level.

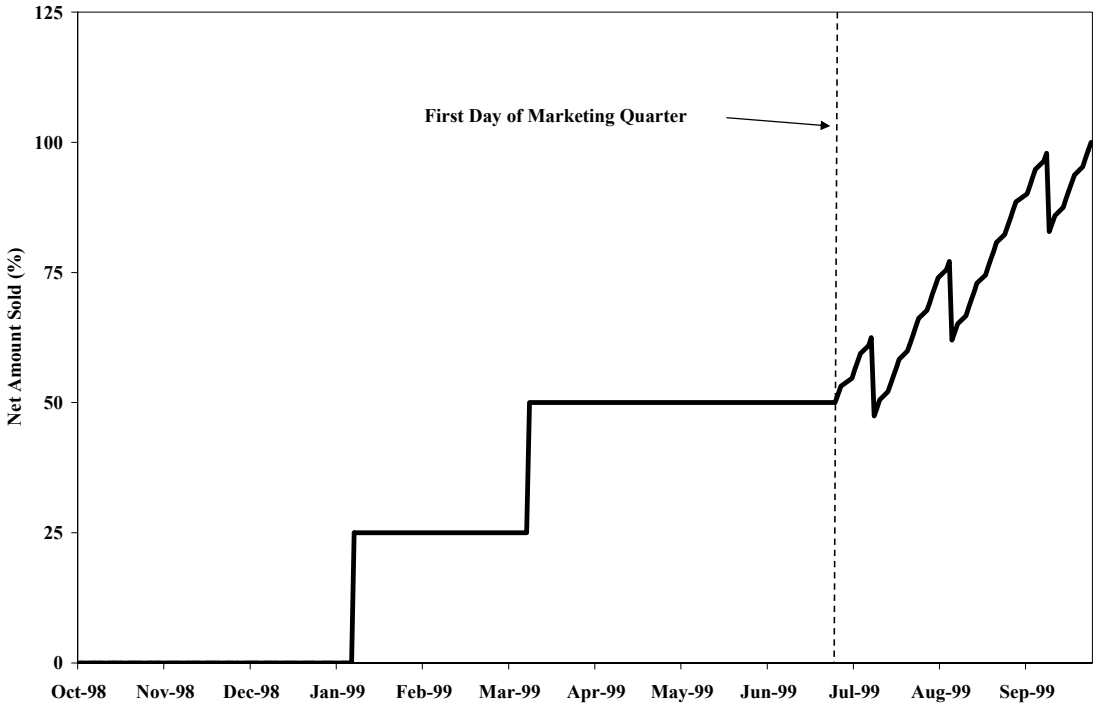
Table 10. Predictability of Market Advisory Program Performance by Rank Between Adjacent Pairs of Marketing Years in Hogs, 1995 - 2001 Marketing Years

Year *t*	Year *t+1*	Number of Observations	Correlation Coefficient	*Z* -statistic	Two-tail *p* -value
1995	1996	10	-0.01	-0.02	0.98
1996	1997	9	-0.24	-0.78	0.43
1997	1998	11	-0.20	-0.68	0.50
1998	1999	11	0.48	1.65	0.10
1999	2000	11	-0.20	-0.68	0.50
2000	2001	10	0.46	1.54	0.12
	Average		0.05		

Note: Two stars indicates significance at the one percent level and one star indicates significance at the fiv
percent level.

Figure 1. Marketing Profile Examples for Hogs

Panel A: Conservative Approach, 1999:III



Panel B: Aggressive Approach, 1999:I

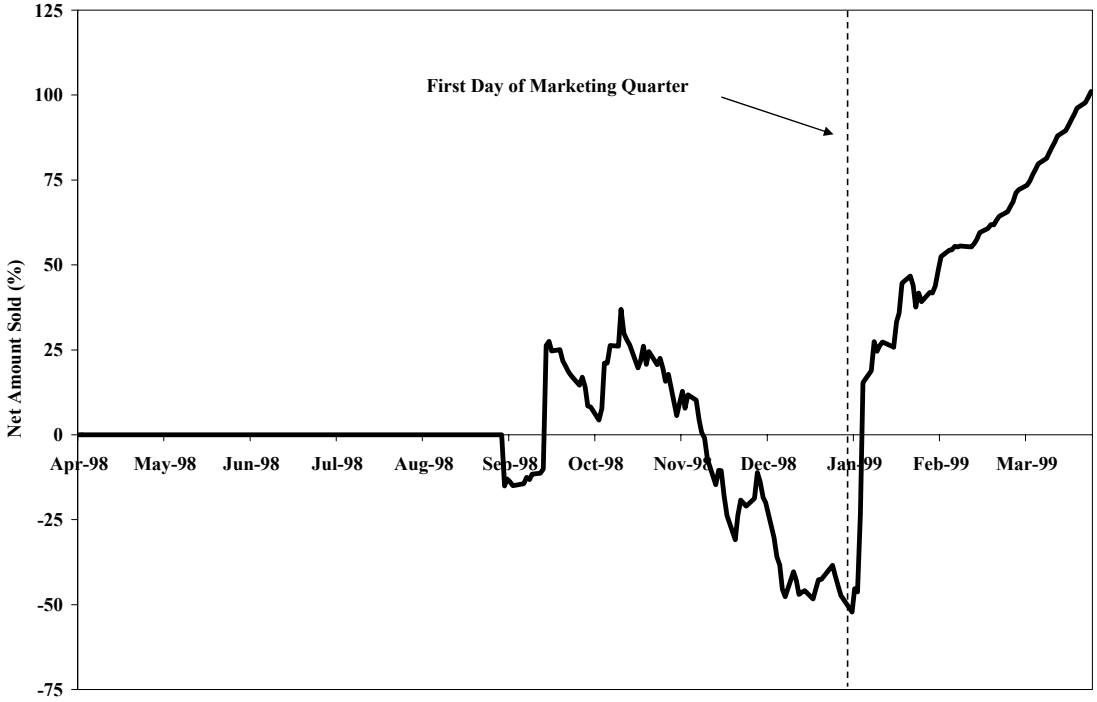


Figure 2. Marketing Profiles for Hogs, All Programs Combined, 1995:I - 2001:IV Marketing Quarters

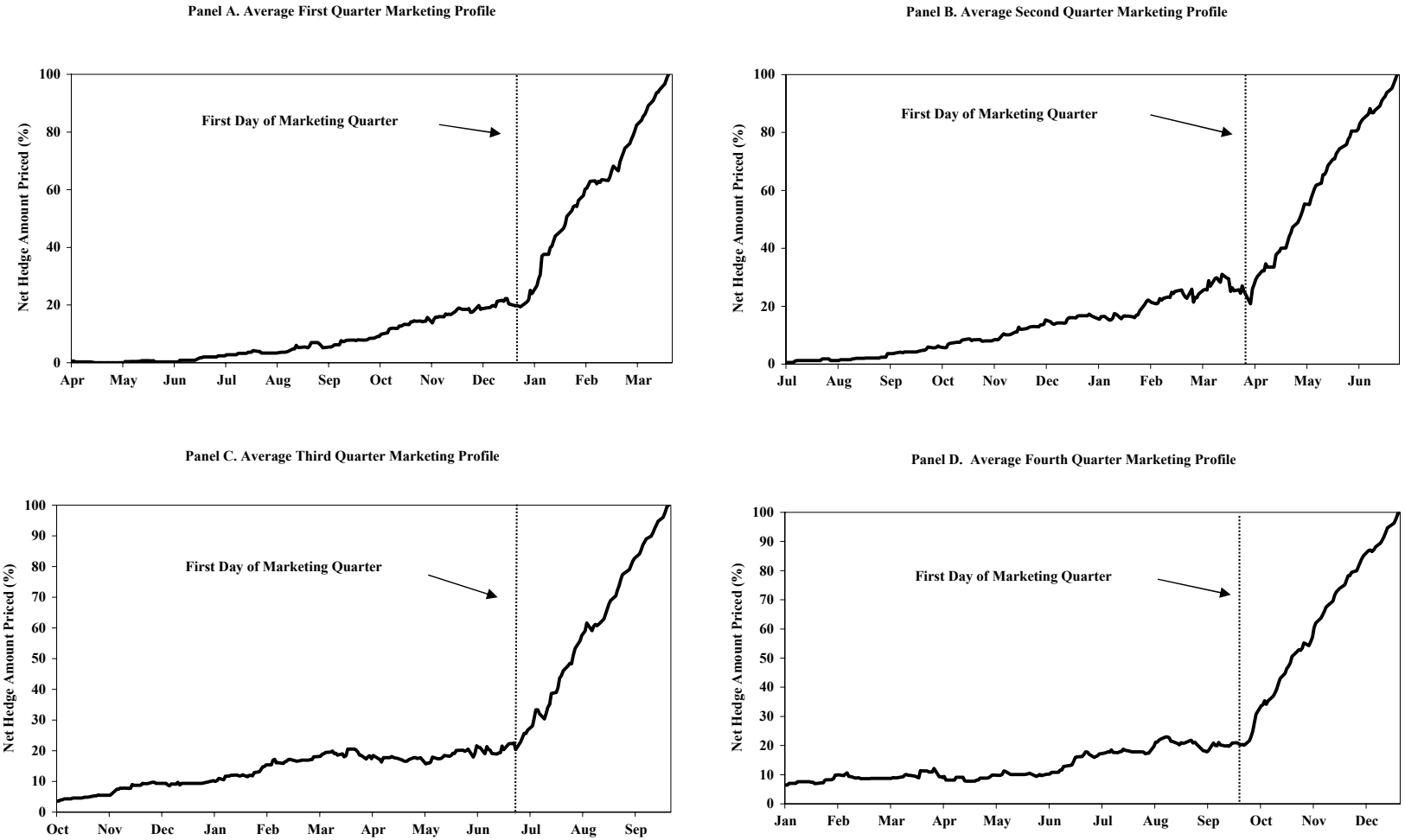
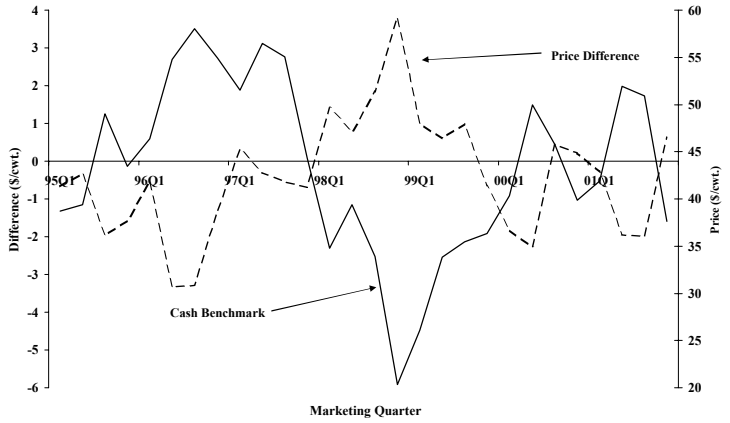
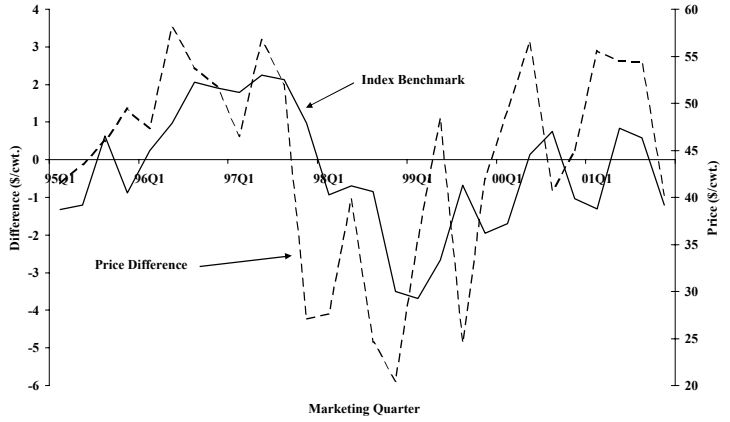


Figure 3. Average Difference Between Advisory Programs and Market Benchmark Prices for Hogs, 1995:I - 2001:IV Marketing Quarters

Panel A. Cash Benchmark



Panel B. Index Benchmark



Panel C. Empirical Benchmark

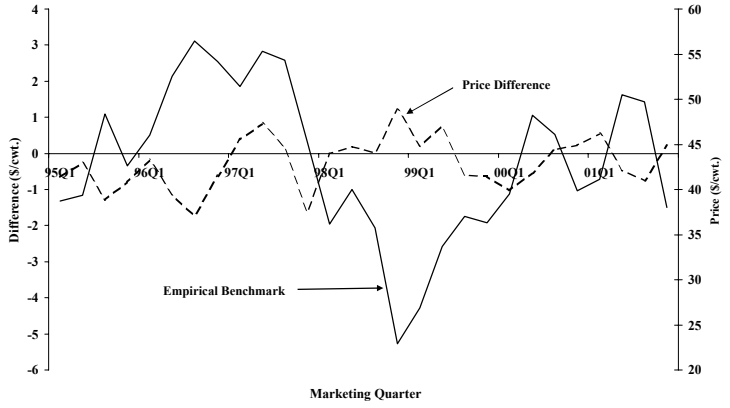
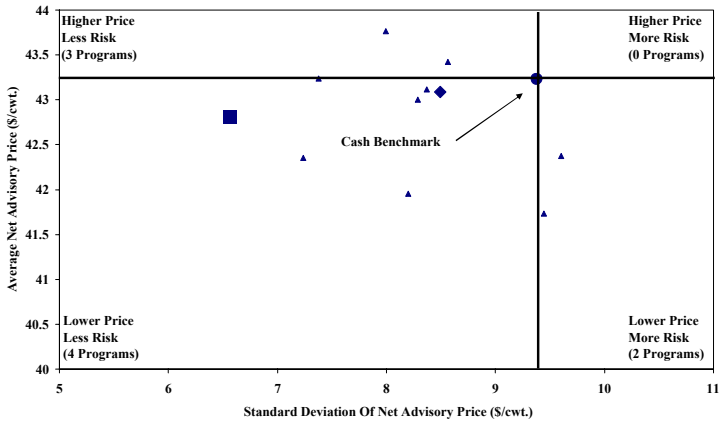
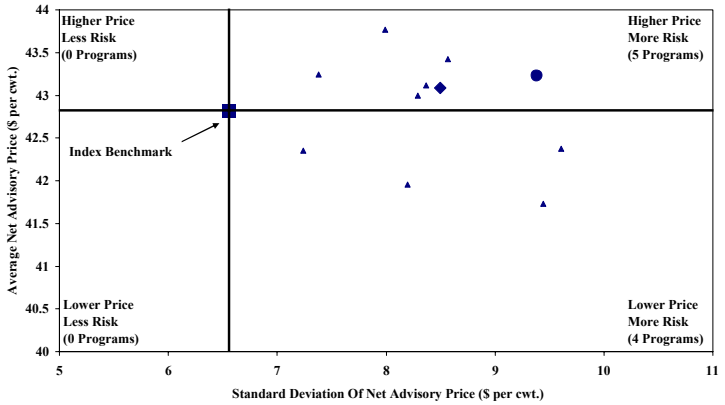


Figure 4. Average Net Advisory Price and Standard Deviation for Nine Advisory Programs versus Market Benchmarks for Hogs, 1995:I - 2001:IV Marketing Quarters

Panel A. Cash Benchmark



Panel B. Index Benchmark



Panel C. Empirical Benchmark